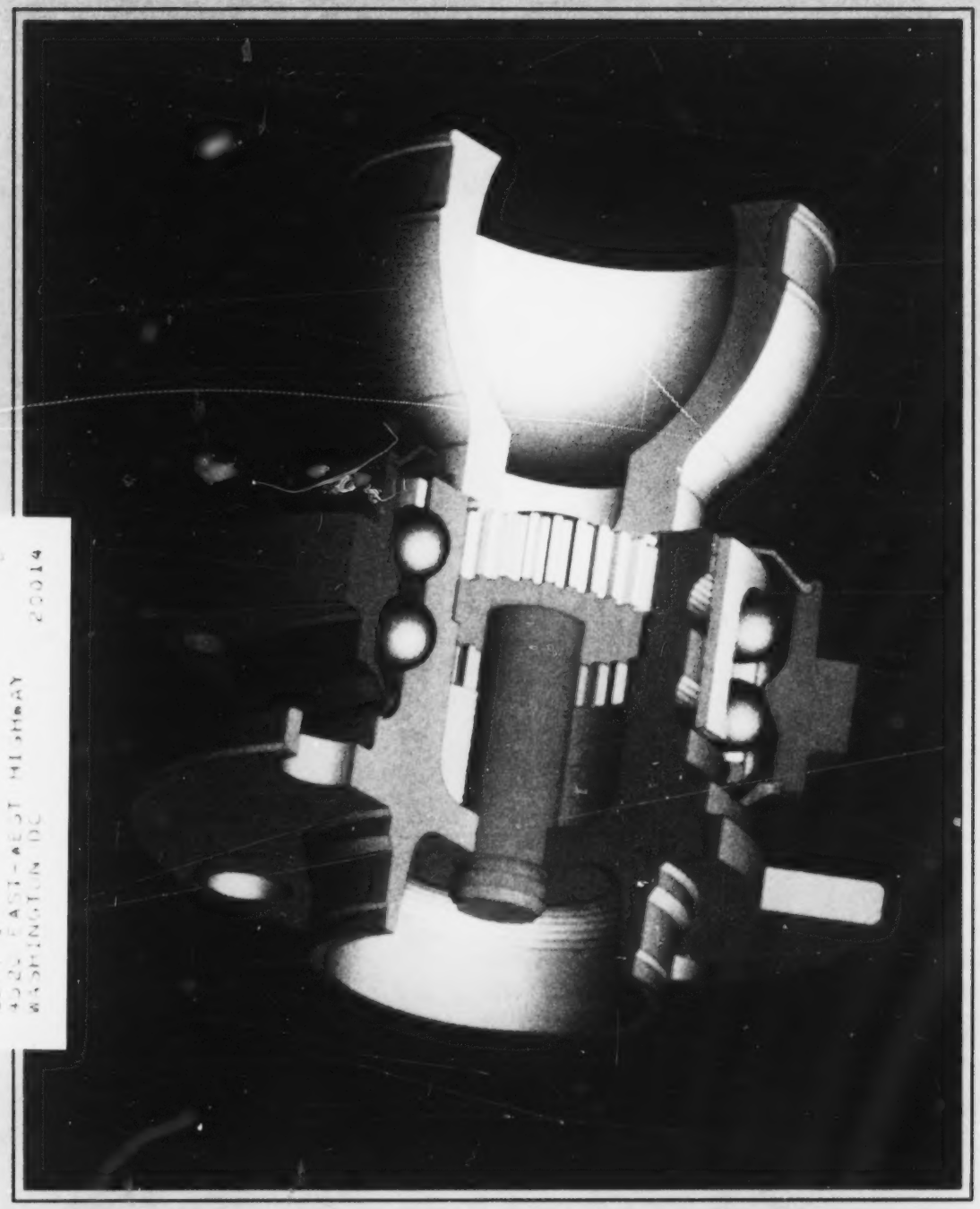
Research & Development

formerly INDUSTRIAL RESEARCH & DEVELOPMENT

MARCH 1984



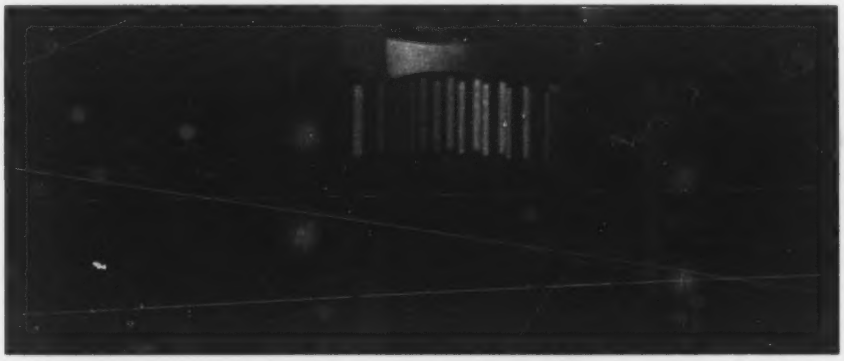
National Design Engineering Show and ASME Conference issue

News of importance to people who work in research, development

Research & Development

SERVING THE $186-BILLION WORLDWIDE R&D INDUSTRY

1984 Design Engineering Show, Chicago, March 26 through 29. See below.



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ABOUT THE COVER

The promotion says that "the design engineers who spend more on components, materials, and CAD/CAM systems come to the only show that meets *all* their needs."

The 1984 National Design Engineering Show and ASME Conference at McCormick Place in Chicago, March 26 through 29, is expected to attract 30,000 design engineers and product specifiers.

Among the CAD/CAM uses is a three-dimensional solid modeling system from Magi, Elmsford, NY. The cover art, from Magi, was made on IBM hardware.

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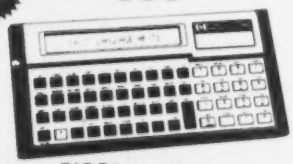

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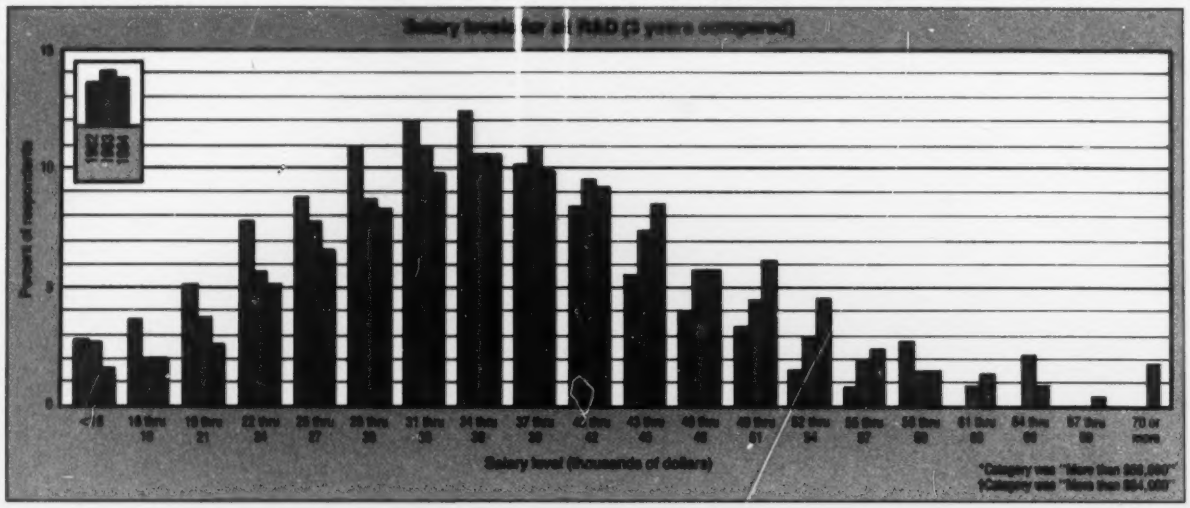


Salaries for workers in R&D hold up for most, but just barely

Net gains were slight in most disciplines, but workers in applied science and technology did not lose ground; and they earn nearly $19 billion a year.

Robert R. Jones
Editor

THERE IS A sameness about certain parts of this year's salary survey results garnered from more than 4,200 respondents who work in research, development, and quality assurance —a sameness when it is compared to last year's—that is at once both wearying and reassuring.

In 1983, our report began with these words: "Salaries are up this year for workers in R&D and quality assurance, as they have been for a number of recent years, but the increases are smaller than in recent years, and some of the gains did not keep up with inflation."

The same is true this year, and the weary drag for our respondents up out of the recession is painfully obvious. However, it is reassuring that the average respondent did not lose buying power in terms of the U.S. inflation rate.

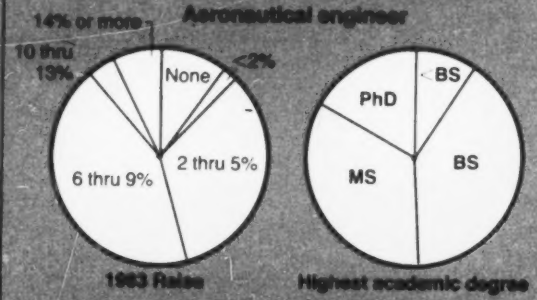
And it is true this year, as it was in the past two years, that the entire salary framework has shifted upward. This increase is demonstrated by our chart which shows "Salary levels for all R&D, three years compared." As there has been in each of the past several years, there is a new upper end for this survey. For this year's report, it is "$70,000 per year or more," and it is occupied by 2.2% of our respondents.

This year, for the first in many years, the percentage of respondents in the lowest salary category, "less than $16,000," has dropped off noticeably. From 2.7% last year it has dropped to 1.6% this year, suggesting that the expansion of the range may be slowing and the upward shift may be more clearly defined.

There is no doubt that salaries for our readers are rising. Just four years ago, 4% of the respondents to this survey said that their annual salary was $46,000 a year or more. The most-populous single salary range that year was $25,000 through $27,000.

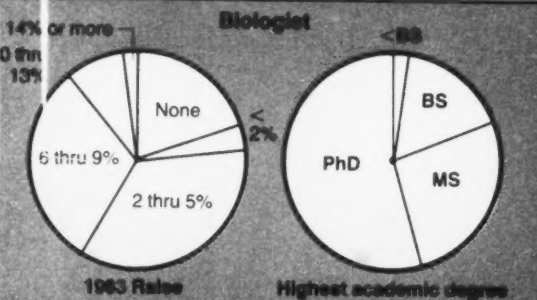
This year's report shows that 25.1% of the respondents are earning $46,000 per year or more. It was 19.6% last year and

Aeronautical engineer



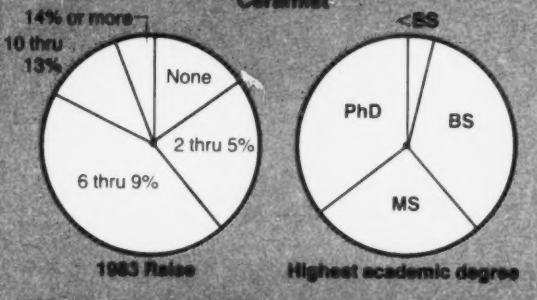
1983 salary range:	<$16,000 = 2.0% >$70,000 = 0.0	Median $43,550
Years with present employer:	< 1 yr = 2.0% >36 yr = 0.0	Median 13.0 yr
Age of respondents:	<26 yr = 2.0% >65 yr = 0.0	Median 48.5 yr
Years of experience:	< 1 yr = 0.0% >40 yr = 2.0	Median 25.9 yr

Biologist



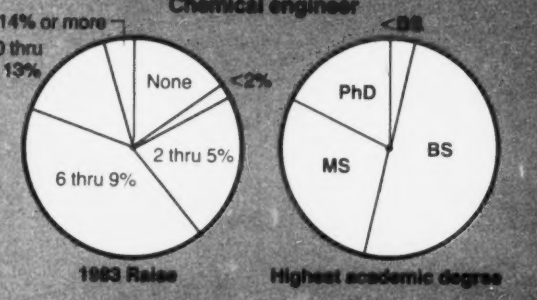
1983 salary range:	<$16,000 = 2.2% >$70,000 = 0.9	Median $33,660
Years with present employer:	< 1 yr = 4.4% >36 yr = 0.4	Median 9.8 yr
Age of respondents:	<26 yr = 2.2% >65 yr = [illegible]	Median 40.1 yr
Years of experience:	< 1 yr = 0.4% >40 yr = 0.9	Median 13.5 yr

Ceramist



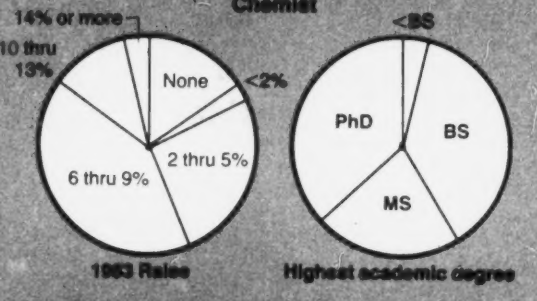
1983 salary range:	<$16,000 = 1.5% >$70,000 = 0.0	Median $39,200
Years with present employer:	< 1 yr = 10.4% >36 yr = 0.0	Median 6.2 yr
Age of respondents:	<26 yr = 7.5% >65 yr = 0.0	Median 37.2 yr
Years of experience:	< 1 yr = 0.0% >40 yr = 1.5	Median 11.0 yr

Chemical engineer



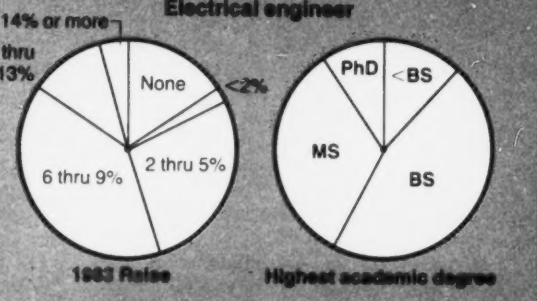
1983 salary range:	<$16,000 = 2.1% >$70,000 = 3.2	Median $40,140
Years with present employer:	< 1 yr = 2.5% >36 yr = 1.4	Median 9.5 yr
Age of respondents:	<26 yr = 5.4% >65 yr = 1.1	Median 40.5 yr
Years of experience:	< 1 yr = 0.7% >40 yr = 2.2	Median 16.7 yr

Chemist



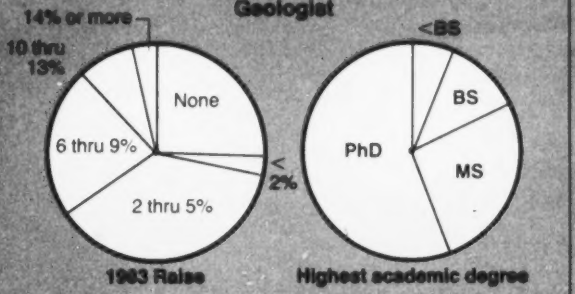
1983 salary range:	<$16,000 = 1.0% >$70,000 = 1.5	Median $36,510
Years with present employer:	< 1 yr = 3.9% >36 yr = 0.8	Median 9.2 yr
Age of respondents:	<26 yr = 2.1% >65 yr = 0.6	Median 40.3 yr
Years of experience:	< 1 yr = 0.3% >40 yr = 1.2	Median 14.1 yr

Electrical engineer



1983 salary range:	<$16,000 = 1.6% >$70,000 = 2.8	Median $39,240
Years with present employer:	< 1 yr = 5.3% >36 yr = 1.6	Median 11.8 yr
Age of respondents:	<26 yr = 3.9% >65 yr = 1.1	Median 45.9 yr
Years of experience:	< 1 yr = 1.4% >40 yr = 2.5	Median 21.4 yr

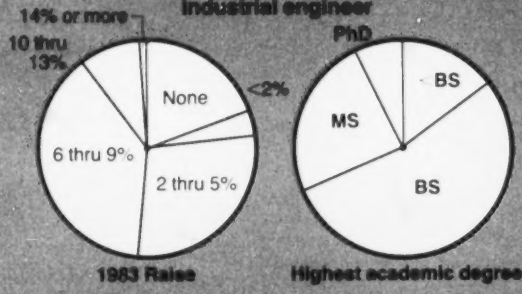
Geologist



1983 Raise — Highest academic degree

1983 salary range:	<$16,000 = 4.0% >$70,000 = 0.0	Median $40,950
Years with present employer:	< 1 yr = 0.0% >36 yr = 0.0	Median 9.0 yr
Age of respondents:	<26 yr = 0.0% >65 yr = 2.0	Median 47.5 yr
Years of experience:	< 1 yr = 0.0% >40 yr = 2.0	Median 18.0 yr

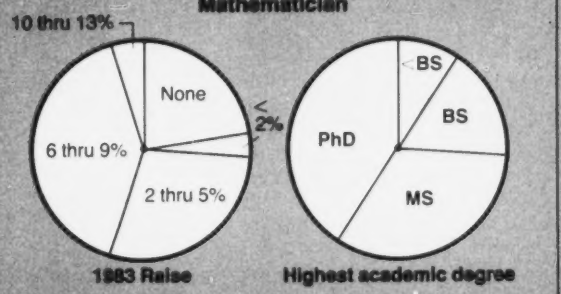
Industrial engineer



1983 Raise — Highest academic degree

1983 salary range:	<$16,000 = 1.8% >$70,000 = 1.8	Median $36,280
Years with present employer:	< 1 yr = 5.4% >36 yr = 3.6	Median 9.6 yr
Age of respondents:	<26 yr = 1.8% >65 yr = 7.0	Median 42.4 yr
Years of experience:	< 1 yr = 0.0% >40 yr = 5.3	Median 16.5 yr

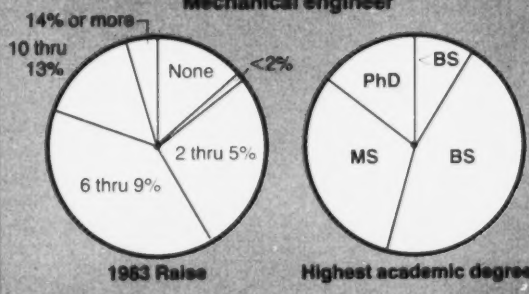
Mathematician



1983 Raise — Highest academic degree

1983 salary range:	<$16,000 = 0.0% >$70,000 = 7.4	Median $44,750
Years with present employer:	< 1 yr = 0.0% >36 yr = 0.0	Median 17.8 yr
Age of respondents:	<26 yr = 0.0% >65 yr = 0.0	Median 50.5 yr
Years of experience:	< 1 yr = 0.0% >40 yr = 3.7	Median 23.6 yr

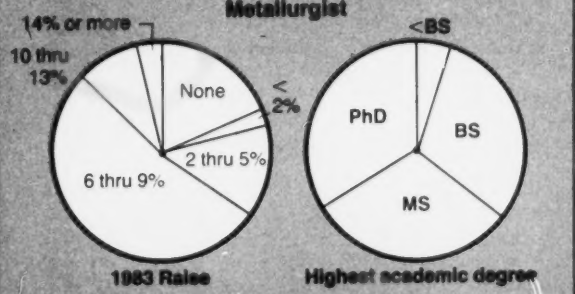
Mechanical engineer



1983 Raise — Highest academic degree

1983 salary range:	<$16,000 = 0.2% >$70,000 = 2.5	Median $40,010
Years with present employer:	< 1 yr = 3.0% >36 yr = 0.5	Median 10.5 yr
Age of respondents:	<26 yr = 2.5% >65 yr = 1.5	Median 44.1 yr
Years of experience:	< 1 yr = 0.0% >40 yr = 4.2	Median 19.6 yr

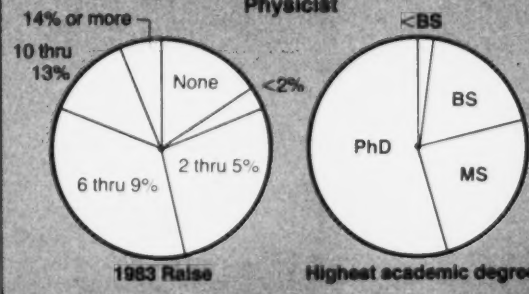
Metallurgist



1983 Raise — Highest academic degree

1983 salary range:	<$16,000 = 0.9% >$70,000 = 3.6	Median $41,310
Years with present employer:	< 1 yr = 4.1% >36 yr = 0.0	Median 7.8 yr
Age of respondents:	<26 yr = 1.8% >65 yr = 0.5	Median 40.4 yr
Years of experience:	< 1 yr = 0.5% >40 yr = 1.8	Median 14.5 yr

Physicist



1983 Raise — Highest academic degree

1983 salary range:	<$16,000 = 2.2% >$70,000 = 2.5	Median $40,770
Years with present employer:	< 1 yr = 6.1% >36 yr = 1.1	Median 9.4 yr
Age of respondents:	<26 yr = 1.9% >65 yr = 2.2	Median 43.0 yr
Years of experience:	< 1 yr = 1.1% >40 yr = 1.4	Median 16.8 yr

12.5% in 1982. This year's most-populous salary range is $34,000 to $36,999 with 10.8% of our respondents there.

All of this adds up to a significant salary check for the R&D industry, a whopping $18.9 billion per year.

With all of this, the median salary for R&D workers has continued to rise. During this past year the rate of increase was much slower than previously, however. In 1981 the increase was 7.8%. In 1982 it was 7.7%. Last year's gain was only 4.25%.

More important for U.S. readers, perhaps, is the fact that in each of the years the increase was greater than their annual rate of inflation.

Buying power was maintained despite the fact that there was a sharp decline in the number of large salary increases. Only 15.9% of our respondents received salary increases of 10% or more last year, compared to 33.4% who received such increases a year ago. Two years ago it was 47.3%, nearly three times this year's percentage.

The differences in rates of salary increase can be seen in the following table:

Increases in salary, all levels R&D

	% of respondents				
Amount	1984	1983	1982	1981	1980
None	16.3	14.7	6.3	5.2	5.7
Less than 2%	2.1	1.9	1.2	0.9	1.5
2 thru 5%	26.9	15.9	10.6	8.0	12.4
6 thru 9%	38.9	34.2	34.5	45.2	52.0
10 thru 13%	11.5	25.1	34.0	29.7	19.6
14% or more	4.4	8.3	13.3	11.0	8.8
Ahead of inflation	54.8	33.4	47.3	40.7	28.4

There are two important things to note in the table. The first is that the number receiving no increase at all has climbed from 6.3% in 1982's report to 14.7% last year and 16.3% this year. Second, because the rate of U.S. inflation has fallen to the 4% range, nearly 55% of this year's respondents received raises that exceeded the rate of inflation, up substantially from earlier years.

The highest percentage of salary increases of 6% or more went to the chemical engineers, with 60.8% doing that well. They barely nosed out the high-flying ceramists for first place. Ceramists, who placed 90% in that upper-increase range two years ago and 83.3% there last year, had 60.6% with raises of 6% or more for this year's report.

Even then, chemical engineers, this year's leaders in 6%+ raises, were down from having 73.8% do that well last year.

Details of this year's salary increases and those for five other salary parameters are displayed in charts for 12 disciplines on the accompanying pages. These charts present an opportunity for you to make comparisons, by disciplines, of education and of salary for age, experience, and longevity using information that is available nowhere else.

Looking at median salaries by disciplines, mathematicians, with 16.4% median salary gain for the past year, moved up from fourth to first place in the rankings. Geologists and industrial engineers also made strong gains.

Poorest showings were made by ceramists and biologists, both losing rank in the comparison table.

Rankings for disciplines by median salary

Rank			Median salary		
1984	1983	Discipline	1984	1983	% increase
1	4	Mathematician	44,750	38,450	16.4
2	1	Aero. Engr.	43,550	41,150	5.8
3	6	Metallurgist	41,310	38,333	7.8
4	9	Geologist	40,950	36,950	10.8
5	3	Physicist	40,770	38,500	5.9
6	2	Chem. Engr.	40,140	38,890	3.2
7	7	Mech. Engr.	40,010	38,100	5.0
8	8	Elec. Engr.	39,240	37,480	4.7
9	5	Ceramist	39,200	38,400	2.1
10	10	Chemist	36,510	34,880	4.7
11	13	Indust. Engr.	36,280	30,520	15.8
12	11	Biologist	33,660	34,380	− 2.1
13	12	Other	33,480	32,450	3.2

Last year's report, bringing data from the depth of the recent recession, appeared to suggest that limited hiring was putting a premium on age, experience, and advanced degrees. This year, with the recession having eased, there appear to be more opportunities for newcomers to R&D.

This would be one explanation for a decrease in the percentage of respondents with PhD degrees. The percentage has moved from 27.6 in 1980 to 29.4 in 1981, 30.2 in 1982, and 32.3 in 1983. This year it dropped off slightly to 30.8.

Biologists no longer lead the disciplines in the percentage with a PhD, having been crowded out of first place by the geologists at 56.0%. Biologists are second at 54.5, and physicists are close behind at 54.3% PhD.

There is a substantial gap from the biologists to the fourth-place discipline, mathematicians at 40.7% PhD. They are followed by chemists, 36.9%; ceramists, 35.4%; and metallurgists, 33.2%.

Industrial engineers have the lowest percentage of respondents with a PhD degree at 7.1.

When masters and doctorates are considered together and the disciplines are ranked for advanced degrees, geologists lead with 82% having an advanced degree. Biologists are next at 80.6%, followed by physicists, 78.8%; mathematicians, 74.0%; and metallurgists, 65.0%.

In the second part of this report, we will look into the implications of some of the above conclusions and also report on the value of an advanced degree to its holder, the premium that is being paid for experience, and the relative salary scales of men and women who work in research, development, and quality assurance. **R&D**